Mei Wu Acoustics

Experts in acoustics, noise and vibration

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Date: **March 20, 2015**

Subject: **Champion School Environmental Noise Study - Revision 2**
MWA Project – 14067

Mei Wu Acoustics is providing acoustical consulting services for the Champion School located at 3924 Williams Rd, San Jose, CA. The school requires an environmental noise study to show compliance with applicable San Jose City codes and regulations. The following report details the results of this environmental noise study.

Executive Summary

This report details the applicable noise codes and standards, measured ambient noise at the site, and our estimations of noise impacts due to construction, increased traffic, and children's voices in the outdoor areas of the site. The key noise requirements are given in terms of the equivalent A-weighted day-night sound level (L_{DN} or DNL hereafter) which is comprised of hourly averaged noise levels, with a ten decibel penalty applied to hours between 10:00 pm and 7:00 am. The hourly sound levels, with penalties applied, are averaged into a single DNL number. **Our calculations, combined with our measured ambient sound levels, show that the resultant noise levels will be 60 dBA DNL including ambient, additional traffic and play area noise combined.** This meets the city of San Jose's exterior noise level objective for residential land uses.

1. Applicable Noise Codes and Standards

1.1. City of San Jose General Plan

San Jose General Plan, Chapter 3, Goal EC-1 Community Noise Levels and Land Use Compatibility, contains details of the acceptable limits of noise hazards. For this project the applicable noise policies are paraphrased as follows:

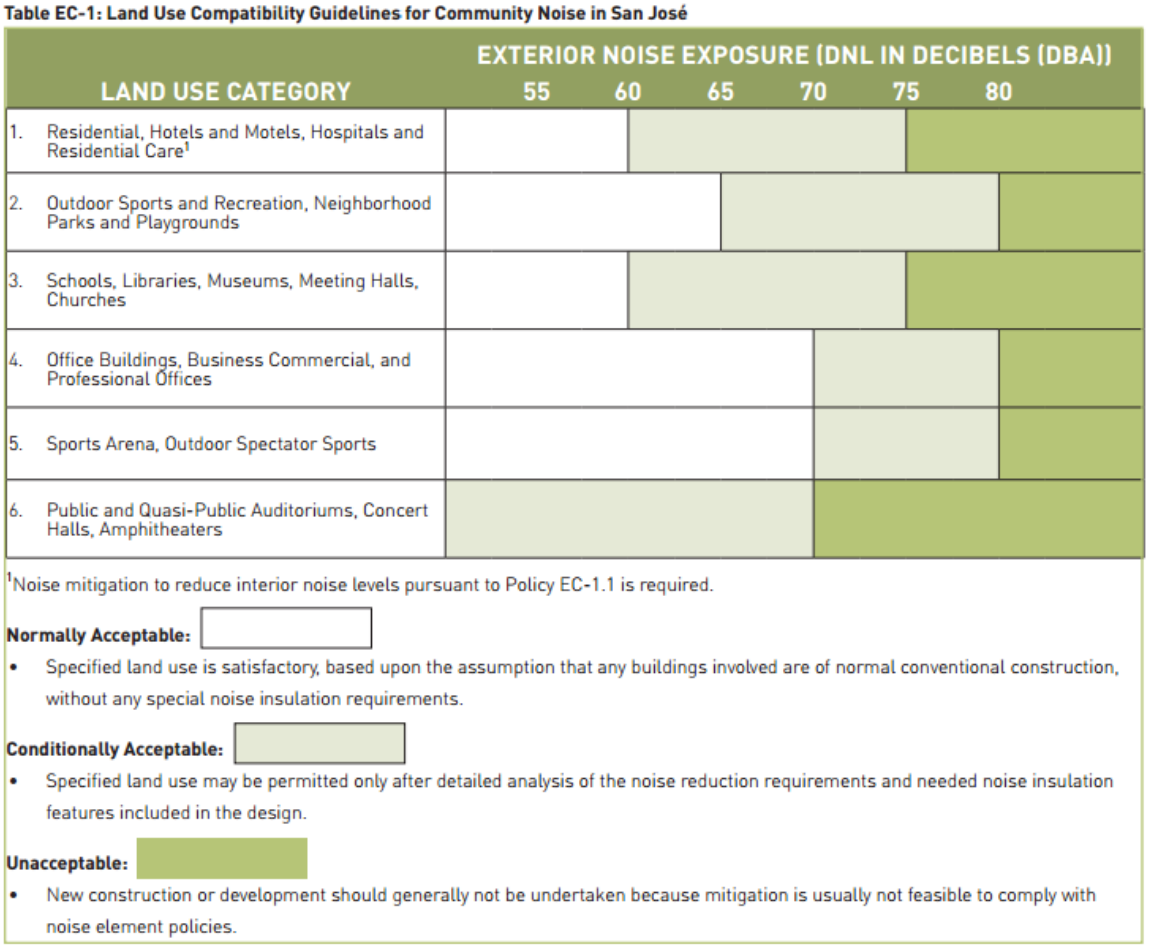
EC-1.1 *Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:*

Exterior Noise Levels
The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level

objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:

- *For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.*
- *For single family residential uses, use a standard of 60 dBA DNL for exterior noise in private usable outdoor activity areas, such as backyards.*

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San José



[1]Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

Normally Acceptable:

- Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable:

- Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

Unacceptable:

- New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

1.2. City of San Jose Zoning Code

The Champion School is zoned in a Commercial Office District and is subject to the following paraphrased section of the San Jose Zoning Code:

20.40.600 Performance Standards

B. …the following specific standards shall apply in the Commercial Zoning Distrcits:

2. Noise

The sound pressure level generated by any use or combination of uses on a property shall not exceed the decibel levels indicated in Table 20-105 at any property line, ***except upon issuance and in compliance with a Conditional Use Permit as provided in Chapter 20.100.***

Table 20-105
Noise Standards

	Maximum Noise Level in Decibels at the Property Line
Commercial use adjacent to a property used of zoned for residential purposes	55
Commercial use adjacent to a property used or zoned for commercial or other non-residential purposes	60

The neighboring zones are residential (R-2) to the east, residential (R-M) to the south and north, residential (A-PD) to the west, and commercial (Commercial Office) to the northeast.

1.3. Comments on Noise Level Requirements

The Champion School will be applying for a conditional use permit. According to San Jose's Noise Element, exterior noise environments for day care facilities between 60 and 75 DB DNL are "Conditionally Acceptable", i.e., the specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

The project-generated noise levels were also evaluated against the standard for the City of San Jose Zoning Ordinance, which limits short-term noise levels to 55 dBA. The Zoning Ordinance specifies a "maximum" sound level limit. However, applying a "maximum" sound level limit, which has a precise technical definition, would preclude nearly all day-care centers, commercial uses and any other use with outdoor activity near residential zones. Our measurements show ambient levels at the site are already in excess of this standard, which would be prohibitive to the project. In practice, the City of

San Jose has, in the past, utilized short-term averages, hourly averages and 24-hour averages for the Zoning Ordinance limits under a Conditional Use Permit.

1.4. California Environmental Quality Act

The following 6 items (a through f) from page 281 of the California Environmental Quality Act Checklist under section XII must be checked with one of the following responses:

- No impact
- Less than significant impact
- Less than significant impact with mitigation incorporated
- Potential significant impact

The checklist items are shown in italics below, with our response and indication of mitigation measures where necessary in red.

XII. Noise. Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
Less than significant impact – see section 5-Noise Impacts, and section 6-Conclusions
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?
No impact
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?
Less than significant impact – see section 5-Noise Impacts and section 6-Conclusions
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?
No impact – see section 5.4 – Construction Phase Noise Impacts
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?
No impact – N/A
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?
No impact – N/A

2. Project Description

The Champion School is a new school in San Jose at 3924 Williams Rd, which is a residential area. The school will serve 120 elementary and middle school students, and 72 preschool students. The site will include parking, a play structure, and a grass area in addition

to the building itself. A 6-foot solid wood fence surrounds the site, separating it from neighboring residences.

An up to date site plan is shown in Figure 1. The noisy areas of focus in this study are the play structure and the grass area. We have been made aware that any changes that may be made to the locations of these areas will not bring them any closer to the neighboring property lines. Therefore, the noise predictions made in this report will be highest expected levels for the project.

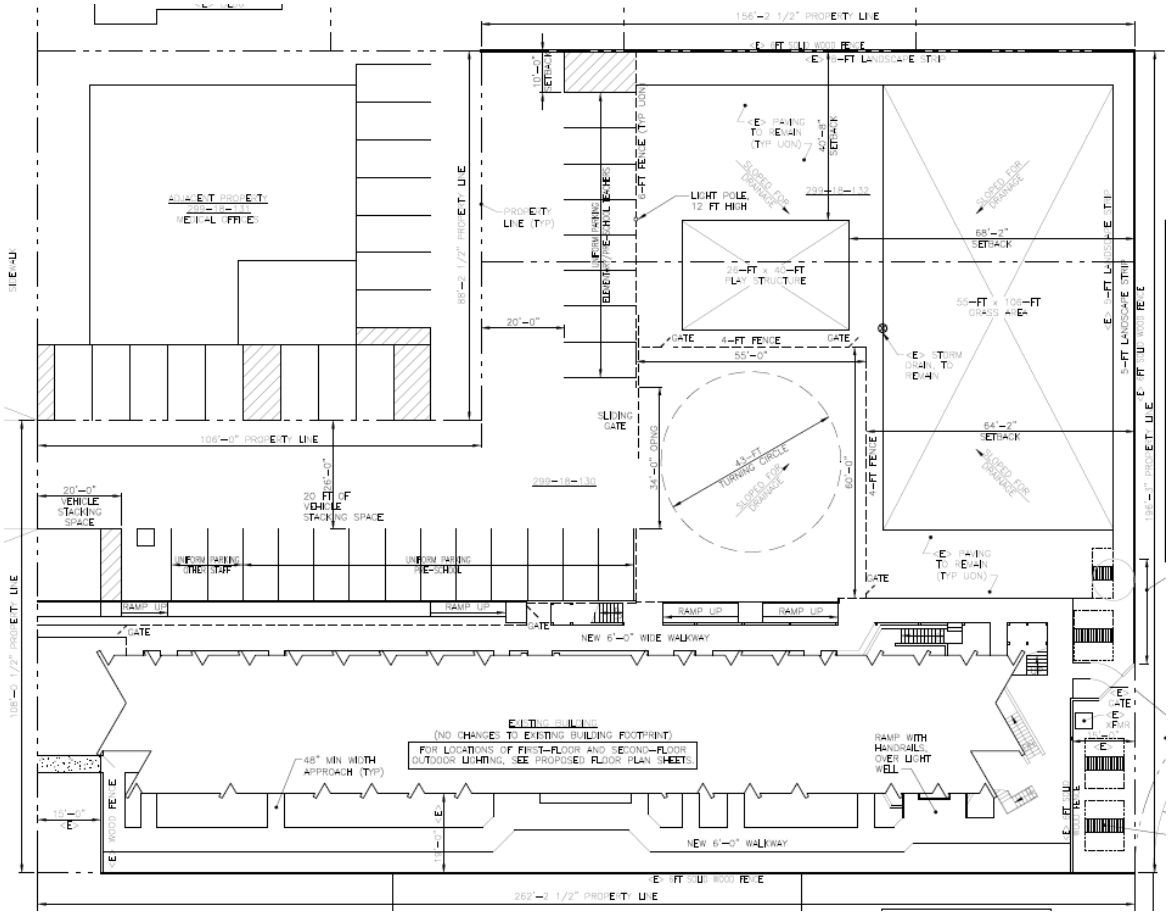


Figure 1: Project Site Plan (Dated 10/27/2014)

3. Existing Noise Levels

Details of our background noise measurement are given below:

MWA Personnel:	Joshua Marcley
Date and time of measurement:	12:30 PM Tuesday 12/23/14 Through 1:00 PM Wednesday 12/24/14
Equipment used:	Cesva SC160 sound level meters (2) Norsonic Type 1251 sound calibrator

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The sound level meters were calibrated to 113.8 dB using the sound calibrator prior to starting the measurement. All sound level meters have been independently lab calibrated according to NIST standards within the past 12 months. Sound pressure levels were measured continuously from 12:30 PM Tuesday 12/23/14 through 1:00 PM Wednesday 12/24/14 at the project's eastern and southern property lines. Both meters were setup to record A-weighted, C-weighted, and Z-weighted Leq levels and A-weighted L1, L5, L10, L50, L90, L95, and L99 levels every five (5) minutes.

The sound level meters were fixed to trees at an approximate height of 10 ft. Figure 2 shows the exact sound level meter placement.

Figure 2: Aerial image of the project site with the approximate property line and measurement locations indicated (via google maps)

The sound level meter located at the southern property line recorded for 8 hours. The 8-hour recording shows that the two meters recorded the same average level (L_{eq}) for the period in which they were both recording. Therefore, the 24 hr levels measured at the eastern measurement location are considered to be valid for the southern measurement location as well.

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4. Background Noise Level Measurement Results

4.1. Establishment of Noise Levels at the Southern Property Line

Sound level data from the meter installed on the southern property line stopped recording at 8:00PM on December 23, 2014 (approximately 8 hours after the measurement began). Figure 3 compares the equivalent sound level from both locations for the period in which both meters were recording.

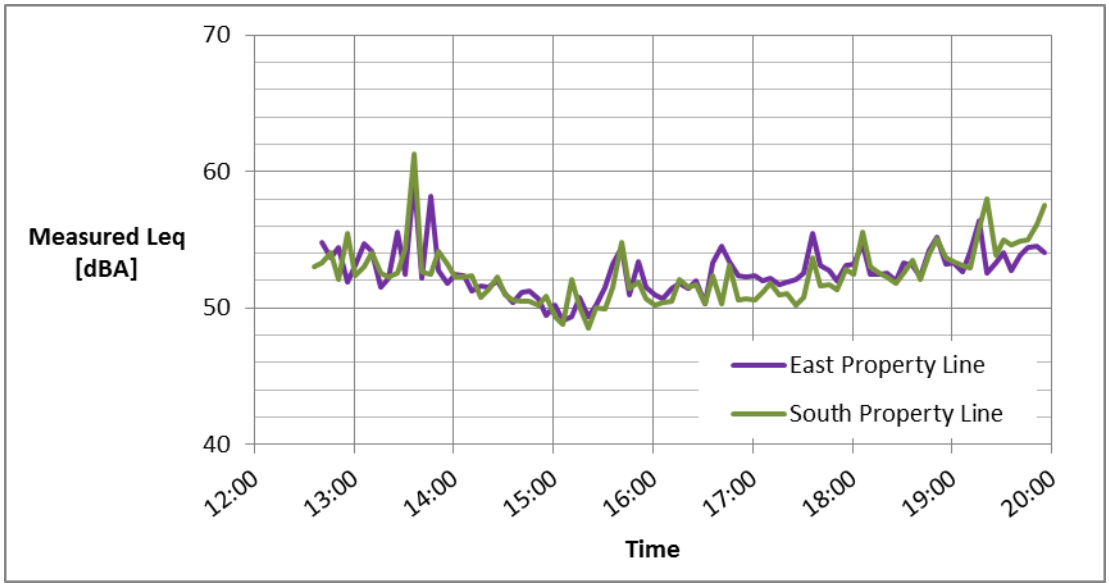

Figure 3: Equivalent sound levels measured by sound level meters installed at the indicated locations on December 23, 2014.

The data show that the measured levels from both locations are approximately the same. Both locations also recorded the same time averaged equivalent level for the approximately 8 hour period to within 0.1dB; this is well within the acceptable error associated with this type of measurement. This shows that the site ambient levels measured at the east property line are valid for both the east and the south property lines. For the remainder of this report the measured levels reported will be those of the sound level meter installed on the east property line, but shall be considered representative of both the east and south property lines.

4.2. Establishment of the Ambient Day-Night Level

The measured noise level for the site is presented in Figure 4.

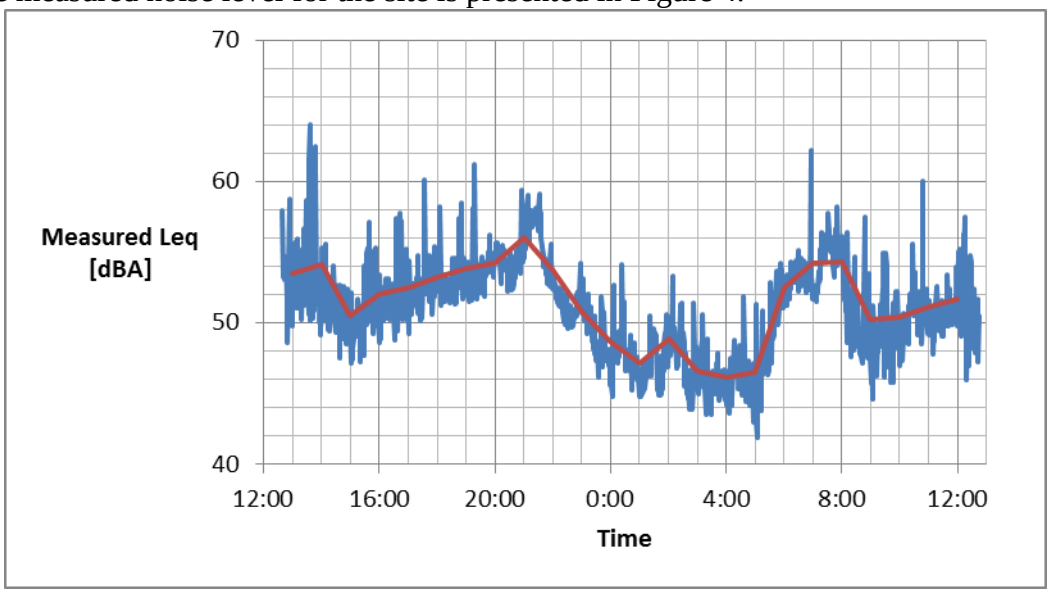

Figure 4: Measured equivalent level presented in 1-min (blue) and 1-hour (red) time averages

The Day-Night Level (DNL) applies a 10dB penalty to sound levels between the hours of 10PM and 7AM. **The ambient DNL measured for this site is 57 dBA.**

5. Noise Impacts

5.1. Traffic/Parking/Drop-Off/Pick-Up

The noise impacts of the traffic/dropoff/pickup/parking noise will cause a negligible increase in the DNL. **Our calculations of the additional traffic noise effects showed a negligible impact (<0.1 dB) on the ambient noise level (DNL).** Since the additional traffic is almost exclusively outside of the hours of 10 PM through 7 AM, (which are penalized 10 dB in the DNL) it would require a more substantial increase in traffic to raise the DNL significantly, given the current ambient noise levels.

The conditions of the calculations are as follows:

- 120 total elementary/middle school students
  - 60 students dropped off each hour between 7 AM and 9 AM
  - 100 students picked up between 3 PM and 4 PM
  - 20 students picked up each hour between 4 PM and 6 PM (overestimated to account for uncertainty)
- 72 total preschool students
  - 24 students dropped off per hour between 7 AM and 10 AM
  - 24 students (1/3 of preschoolers) picked up between 11 AM and 12 PM
  - 16 students picked up each hour between 3 PM and 6 PM (remaining 2/3 of preschoolers)

- Each arriving vehicle drops off or picks up 1 student and includes car doors opening/closing
- Parking lot speed limit of 10 MPH

5.2. Playground Activity

We produced calculations to estimate the noise impacts from children on the play structure, using the following assumptions:

- Each person on the playground is modeled as a point source.
- We assume 40 students are at or near the play structure, in 3 groups: 1 group at the center of the play structure, 1 group between the play structure and school building, and 1 group between the play structure and property line. These groups are, respectively, 54, 70, and 35 feet from the nearest point on the property line.
- Existing ambient noise levels and additional traffic/parking noise from Champion School at the site are included in the calculation.
- The frequency spectrum levels for each of the various vocal exertions of children are presented in Table 1. These numbers are taken from an exhaustive speech noise study by Pearsons, Bennett and Fidell in a report for the Environmental Protection Agency entitled *Speech Levels in Various Noise Environments*, report number EPA-600/1-77-025. We consider the calculations based on these numbers to be the most accurate method for estimating the noise levels for a given number of children at play, compared to site measurements, which are wildly variable depending on ambient conditions and the number and mood of children present in a noise measurement.

	Frequency									
	125	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**
Casual	23	25	42	47	39	43	49	48	43	39
Normal	24	29	43	51	47	47	53	52	49	44
Raised	25	30	41	51	54	53	55	58	57	54
Loud	24	29	41	51	54	58	60	60	63	61
Shouted	24	45	43	49	53	61	66	66	67	72

	Frequency									
	1250	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**dBA**
Casual	37	38	38	33	33	33	33	33	33	**51.9**
Normal	43	43	41	38	39	40	38	36	37	**56.48**
Raised	54	54	50	46	47	48	45	43	43	**63.74**
Loud	62	63	60	54	54	54	52	49	48	**70.51**
Shouted	72	72	71	65	66	66	63	47	54	**79.85**

Table 1: Sound levels for various vocal exertions in children at 1m (Pearsons et. al. 1977)

Our noise level prediction allows for 8 students to be speaking casually, 8 students to be speaking normally, 8 to be speaking with raised voices, 8 to be speaking loudly, and 8

students to be shouting. The Champion School expects no more than 40 students on the playground at any given time.

The noise levels of each student (based on the values in Table 1) are combined and logarithmically summed with the measured ambient levels and calculated traffic noise levels and then averaged for the entire day to achieve the Day-Night Level. Under the conditions described above **the calculated Day-Night Level is 60 dBA on the eastern property line at the point which is nearest to the playground.** Existing 6-foot solid wood fences will reduce noise levels to adjacent properties even further. The level will decrease along the property line as the distance from this point increases. **The maximum sound level due to play structure noise could be up to 67 dBA.** This number assumes 8 children shouting simultaneously at the play structure, as heard at the nearest point on the property line.

5.3. Grass Area Noise Level Prediction

The following calculation assumes that the 8 casual speakers, 8 normal speakers, 8 raised voice speakers, 8 loud speakers, and 8 shouting children are moved from the playground to the grass area. The calculation details are as follows:

- All traffic and ambient noise conditions are the same as in the previous calculation
- Students are considered to be point sources
- Students on the grass area are distributed evenly in 3 locations along the centerline of the field, running North-South
    - The center point of the grass area is one location
    - The remaining locations are located one-quarter field length (~26 ft) to the north and one-quarter field length to the south of the field's center point
    - 40 students will be on the playground non-stop from 7 AM to 6 PM
    - The students will make noise appropriate for their ages and activities

Under these conditions the location on the southern property line at the point closest to the center point of the grass area experiences approximately **60 dBA DNL (57 dBA due to activities of the Champion School alone and 57 dBA due to ambient) or below.** Existing 6-foot solid wood fences will reduce noise levels to adjacent properties even further. The level will decrease along the property line as the distance from this point increases. **The maximum sound level due to grass area noise could be up to 79 dBA.** This number assumes a child shouting at the property line.

5.4. Construction Phase Noise Impacts

From the San Jose General Plan:

EC-1.7 Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City's Municipal Code. The City considers significant construction noise impacts

to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

> *• Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.*

For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

The city also has standard permit conditions that protect neighbors from construction noise. We recommend that Champion school adhere to the following additional requirements:

- *Construction will be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday for any on-site or off-site work within 500 feet of any residential unit. Construction outside of these hours may be approved through a development permit based on a site-specific construction noise mitigation plan and a finding by the Director of Planning, Building and Code Enforcement that the construction noise mitigation plan is adequate to prevent noise disturbance of affected residential uses.*
- *The contractor shall use "new technology" power construction equipment with state-of-the-art noise shielding and muffling devices. All internal combustion engines used on the project site shall be equipped with adequate mufflers and shall be in good mechanical condition to minimize noise created by faulty or poor maintained engines or other components.*
- *Locate stationary noise generating equipment as far as possible from sensitive receptors. Staging areas shall be located a minimum of 200 feet from noise sensitive receptors, such as residential uses.*

Since the construction at Champion School is unlikely to continue for more than 12 months, noise impacts due to construction should be permissible provided the above limitations are followed.

6. Conclusions

Our calculations show that the impact due to the parking/traffic/drop-off/pick-up noise is close to negligible, with **less than 0.1 dB increase in the DNL** over the existing ambient noise levels at the site.

Our calculations show that noise from the grass area and play structure, with the ambient and additional traffic noise included will be **60 dBA DNL or lower** at the loudest points on the property line. This meets the city of San Jose's exterior noise level objective for residential land uses.

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Please contact Mei Wu Acoustics if you have any questions or comments.

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